

CLAIMS

1. An image reading apparatus, comprising:
 - a data calculation unit to calculate moving average data and second derivative data for a plurality of samples made of multivalued data, the plurality of samples being data in a vertical direction and a horizontal direction in reading an inputted image data;
 - a position detection unit to detect first and second positions at which the moving average data and second derivative data have a predetermined relationship based on the moving average data and second derivative data, for each of the plurality of samples;
 - a parallel region determination unit to determine a parallel region based on the first and second positions detected for each of the plurality of samples;
 - an inclination detection unit to determine inclinations of four sides of the inputted image based on the determined parallel region; and
 - an inclination detection unit to correct the inputted image data based on the detected inclinations.
2. The image reading apparatus according to claim 1, further comprising:
 - a sample extraction unit to extract the plurality of samples in the vertical direction and horizontal direction in reading from the inputted image data.
3. The image reading apparatus according to claim 2, wherein the sample extraction unit determines positions to extract the plurality of samples according to an extraction ratio designated from an outside of the image reading apparatus.
4. The image reading apparatus according to claim 2, further comprising:

an image data conversion unit to generate multivalued image data based on the inputted image data before the plurality of samples are extracted, when the inputted image data is color image data or binary image data.

5. The image reading apparatus according to claim 1, wherein the position detection unit detects points at which the second derivative data has a maximum value and has a value larger than the moving average data as the first and second positions.

6. The image reading apparatus according to claim 1, wherein the position detection unit detects points at which the second derivative data has a minimum value and has a value smaller than a value obtained by reversing a polarity of a value of the moving average data on a point having the second derivative data of a maximum value, as the first and second positions.

7. The image reading apparatus according to claim 1, wherein the parallel region determination unit determines the parallel region in the vertical direction based on a distribution of a distance between the first and second positions for the plurality of samples in the vertical direction in reading, and determines the parallel region in the horizontal direction based on the distribution of a distance between the first and second positions for the plurality of samples in the horizontal direction in reading.

8. The image reading apparatus according to claim 1, wherein the inclination detection unit determines linear equations of the four sides of the inputted image, determines four apexes based on intersections of the four sides, and determines the inclinations of the four sides.

9. The image reading apparatus according to claim 8, further comprising:

an image output unit to determine four corrected apexes based on the detected inclinations, extract a rectangular image determined by the corrected apexes, and output the rectangular image.